

PVTx and Isochoric Heat Capacity Measurements for Aqueous Methanol Solutions

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Isochoric heat capacity and PVTx properties of an aqueous methanol solution (0.50 mass fraction or 0.36 mole fraction of methanol) were measured in the liquid phase with a twin - cell adiabatic calorimeter. Temperatures ranged from 302 to 422 K, and pressures ranged to 20 MPa. The calorimetric-cell (70 cm³ capacity) was surrounded by adiabatic thermal shielding (high vacuum) and a steel-sheathed electric heater wound tightly on its surface. The sample pressures were measured by means of a quartz crystal transducer. The relative uncertainty of CV was estimated to be 2 %, by combining the various sources of experimental uncertainty using a root-sum-of-squares formula. The results for pure methanol were compared with other recent measurements from by Polikhronidi et al. by means of a second high temperature, high pressure, nearly- constant adiabatic calorimeter. Good agreement (deviation within 3 %) was found between the CV data reported by Polikhronidi et al. and the present results for pure methanol. The uncertainty of the density measurements is about 0.1 %. The measured densities were used to calculate excess molar volumes that were compared with values calculated with a reliable model by Simonson et al. Good agreement within 0.008 cm³· mol⁻¹ (or 0.03 % of the density) was found between measured and calculated values of the excess molar volumes.